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NIE 22-64
18 November 1964

[redacted]

27 NOV 1964
3676

NATIONAL INTELLIGENCE ESTIMATE

NUMBER 22-64

The French Advanced Weapons Program

Submitted by the
DIRECTOR OF CENTRAL INTELLIGENCE
Concurred in by the
UNITED STATES INTELLIGENCE BOARD
As indicated overleaf
18 NOVEMBER 1964

[redacted]

SECRET

[redacted]

No. 377

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The Central Intelligence Agency and the intelligence organizations of the Departments of State, Defense, AEC, and NSA.

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Director of Intelligence and Research, Department of State
Director, Defense Intelligence Agency
Director of the National Security Agency
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THE FRENCH ADVANCED WEAPONS PROGRAM

CONCLUSIONS

A. The French will probably begin a series of underground tests in the Sahara in late 1964 aimed at developing thermonuclear techniques. These tests could provide the French with an opportunity to claim that they had a "thermonuclear capability." Atmospheric testing at the Pacific test site will probably begin in 1966. French production of fissionable materials will be sufficient to meet anticipated military requirements. (*Paras. 1-6*)

B. The first French strategic delivery system is based on the Mirage IV-A jet bomber. The French Air Force now has about a dozen Mirage IV-As: the remainder of the planned force of 62 probably will be delivered by the end of 1966. Such missiles could be deployed somewhat earlier in soft sites with fission warheads of lesser yield. (*Paras. 10, 15, 16*)

C. The French submarine-missile force is to consist of three to five nuclear submarines, each armed with sixteen 1,600 n.m. missiles. The first missile launching submarine is not likely to become operational before 1970.

[redacted] (*Paras. 18, 20-21*)

D. The cost of the French nuclear weapons program now accounts for a little over one percent of France's GNP, and may absorb about two percent in the late 1960s. Overall, military expenditures are about five and one-half percent of GNP. There are strong political pressures on the government to hold down the military burden on the economy, but we believe that de Gaulle will do what is economically and politically necessary to keep the French nuclear weapons program close to schedule. A post-de Gaulle government might slow down the program, but we do not believe that domestic pressures to limit military expenditures would cause any likely successor government to abandon or cut it back drastically. (*Paras. 24-26*)

DISCUSSION

I. PROGRESS AND PROSPECTS OF THE FRENCH ADVANCED WEAPONS PROGRAM

A. Nuclear Weapons

1. While the French started their nuclear weapons program several years before de Gaulle returned to power in 1958, he has made it his own. He regards the possession of nuclear weapons as an essential attribute of great power status, and as an indispensable underpinning of an independent French foreign policy. France has conducted [redacted] tests, and further tests are scheduled beginning later this year.[1] [redacted] The French are now in a position to expand their fission weapons program and to begin development of thermonuclear weapons.

2. France has access to sufficient uranium to meet the needs of its nuclear research, power, and weapons programs for the foreseeable future. Deposits of economically recoverable uranium in metropolitan France are estimated to contain at least 50,000 metric tons of natural uranium. In addition, France has access to sizable uranium reserves in former French African territories, principally in the Malagasy Republic and Gabon. To conserve domestic reserves, France imports uranium from South Africa and elsewhere to meet much of its current needs. At present, the French are extracting about 1,600 metric tons of natural uranium annually. This exceeds current requirements, and therefore allows some stockpiling against increased consumption in the late 1960s.

3. Two main fissionable materials, plutonium and enriched U-235, are produced from natural uranium for nuclear weapons use. At present only plutonium is available to the French for weapons use. The Marcoule[2] reactor complex includes three natural uranium-graphite reactors. It has been in operation for several years and is devoted to the production of plutonium for weapons. [redacted]

4. The French are constructing three other natural uranium-graphite reactors near Chinon as part of their electric power program. These reactors will also produce plutonium, [redacted]

[redacted]

The first of the Chinon reactors will begin producing plutonium in 1965, and by 1968 all three will be functioning. Two additional power reactors are scheduled for later construction elsewhere in France.

5. France is building a gaseous diffusion plant at Pierrelatte for the production of enriched U-235. Construction began in late 1960 and is now scheduled to be completed in 1967. Output of enriched U-235 began in 1964, and, according to present plans, enrichment levels will be achieved about mid-1965. enrichment levels are planned for about mid-1966, and enrichment for about mid-1967. The plant and other required facilities probably will be completed on time. We believe that these French expectations are reasonable.

6. These tests could afford the French an opportunity to claim that they had acquired a "thermonuclear capability." The missiles for the submarine-launched system will require lighter warheads of about 1,200 pounds.

7. French Government sources frequently have stated that their armed forces are to be provided with tactical nuclear weapons beginning in 1970. The specific types of such weapons have never been defined, but the French apparently plan to develop a nuclear capability for some tactical and ground support aircraft of their advanced Mirage III series, and to develop nuclear

warheads for short-range missiles for use by ground forces.

8. The French are building nuclear test facilities in the Tuamotu Archipelago, southeast of Tahiti, in the Pacific. The first tests at this new facility, the Centre d'Experimentations du Pacifique, are now planned for 1966, but we cannot exclude the possibility that testing may begin there during 1965. Construction at this site is progressing rapidly and on schedule.

9. Under the terms of its present agreement with Algeria, France can continue underground nuclear tests in the Sahara through July 1967. It appears likely that the French have decided to begin tests there involving thermonuclear reactions before their Pacific test center is ready.

B. Delivery Systems

Aircraft

10. The French are constructing a strategic delivery system based on the Mirage IV-A jet bomber, of which the French Air Force now has about a dozen. Current plans call for production of two aircraft per month, and by the end of 1966, the French Air Force is scheduled to have a total of 62 Mirage IV type aircraft. The nominal operating radius of the Mirage IV-A is about 1,100 n.m. without refueling and 1,500 n.m. with one refueling.[3] For refueling purposes, France has twelve KC-135 jet tanker aircraft recently purchased from the US, and may seek to buy additional tankers.

11. The French have encountered difficulties with the jet engines installed in the first production models of the Mirage IV. For future models they may be considering an advanced Pratt and Whitney engine, of which they already have bought two for experimental use with their newest tactical aircraft. However, this engine is larger than the one used in the French bomber. It would be very difficult to retrofit existing Mirage IVs with this engine, and considerable redesigning would be required to fit the engine into future production models. This engine would, however, improve the performance characteristics of the Mirage IV, particularly its operational radius.

[3] The calculated operating radii of aircraft are dependent on such factors as altitudes, payload, and speed, and vary considerably with the conditions of operation which are postulated. The figures given above for the Mirage IV-A assume a payload of 3,400 pounds, flight altitudes of 40,000 to 50,000 feet at a cruising speed of Mach 0.9, and one high speed dash of about 250 n.m. at Mach 1.7. Lower altitudes or prolonged supersonic speeds would cut the aircraft's operational radius drastically.

12. The Mirage IV system poses only a limited threat to the USSR. Operating as a separate national force, the French Mirage IVs would be vulnerable to the present Soviet and East European air defense system, and even more vulnerable to the air defense system which the USSR will probably have by the end of 1966. Nevertheless, the Soviet leaders must take account of the Mirage IV system because they cannot assume that none would be able to penetrate their defenses.

13. The French have considered various methods to improve the effectiveness of the Mirage IV delivery system. Apparently, in 1963 the government considered—and then rejected—plans to redesign the Mirage IV as a much larger aircraft with improved performance including greater range. The French are also looking into the possibility of developing an air-to-surface missile for the Mirage IV. The relatively light payload of the aircraft, however, would require the use of missiles of such short range as to have only limited additional value.

14. For their tactical aircraft system the French apparently intend to concentrate on providing a nuclear capability for the Mirage III series. These aircraft have relatively short range, maximum speeds of Mach 2, and weigh about 20,000 pounds. The French are also well advanced in the development of both short-takeoff-and-landing and vertical-takeoff-and-landing aircraft, and probably will be able to develop and produce them in substantial numbers by 1970. Air-to-surface missiles being developed by the French with the British and West Germans respectively will be used on these aircraft as tactical weapons.

Land-Based and Submarine-Launched IRBMs

15. The second generation delivery system, according to French defense plans, was to have been submarine-launched intermediate range ballistic missiles. The French now plan to deploy first a land-based IRBM system. Such a delivery system is included in the Program Law, now before the French Assembly, which outlines military plans for the period 1965-1970. An increasing realization of the limitations of the Mirage IV system, and a desire to have a more meaningful deterrent before the nuclear submarine system is available, have probably pushed the French Government into this decision in spite of the government's awareness that considerable internal opposition may arise.

16. The land-based IRBM missiles which the French are planning will be two-stage, solid fuel vehicles, with a range of up to 1,600 n.m., and will carry a warhead of about 2,000 pounds. Available evidence indicates that the French plan to use hard and dispersed sites, and hope to be able to deploy their first IRBMs in such sites by the end of 1966. However, we believe that they are not likely to be able to deploy their first missiles in hard sites before 1968, since the silo program is apparently not yet beyond the planning stage. Definite

decisions probably have not even been made on the specific locations of the silos. While such missiles could be deployed somewhat earlier in soft sites, the French seem at this time set on confining themselves to hard silos.

17. The French are building a missile test range at Biscarosse, on the Atlantic coast south of Bordeaux in the department of Landes. They have stated that flight tests of their IRBMs will begin at the Landes test center in mid-1965. We believe that this schedule will probably be met, and that with further testing the missiles themselves could be ready about two years later. The French also intend to build in the next several years a launch facility in French Guiana, but our evidence indicates that it will be used for the launching of earth satellites and for other space research purposes, and not as a military missile test installation. Experience gained in French Guiana, of course, will be relevant to the French military missile program.

18. The nuclear submarine-ballistic missile delivery system planned by the French is to consist of three, and perhaps eventually five, submarines. Each is to be armed with sixteen 1,600 n.m. missiles, which will be of smaller dimensions than the planned land-based IRBMs. The warhead weight of the submarine missile will probably be no more than 1,200 pounds. The announced specifications of the first nuclear submarine are as follows:

Displacement [4]	7,900 tons (surface)
Displacement	9,000 tons (submerged)
Length	420 feet
Speed	20 knots
Number of torpedo tubes	4
Number of missiles	16
Number of crew	135

The French have also announced that the operating depth of the submarine will be "more than 200 meters" (660 feet).

19. In March 1964, the French launched a conventionally powered submarine with four missile tubes installed. They plan to use this submarine to test the Polaris-type missile system later in the decade. At Cadarache they have been developing a prototype nuclear propulsion unit for their submarine. The reactor for the propulsion unit is of the enriched uranium-pressurized water type. It went critical during the summer of 1964.

20. The French now say that the first submarine will be operational in 1970, with the second and third to follow in the early years of the next decade. The French probably can produce all the components for a missile firing nuclear submarine system by 1969. However, given the complexities of putting this weapons system together, perfecting and testing it, and training personnel to man it, we believe it will be at least 1970 before the first such submarine becomes fully operational. All three submarines will probably be operational by 1973. Given likely maintenance and upkeep cycles, France will probably be able to keep each submarine at sea about two-thirds of the time. When three submarines are available, two of them (i.e., 32 missiles) could be at sea most of the time. With five submarines, at least three, and sometimes four, would normally be at sea. In the early years of operation, it is to be expected that difficulties with the system will degrade these figures.

21. When operational, the French submarine-launched and land-based missiles will constitute a considerable force. With a range of 1,600 n.m. the land-based missiles could hit most Soviet territory west of the Urals, and the submarine missiles would have a similar capability from their most likely launching areas, i.e., the eastern Mediterranean and the Norwegian Sea. The guidance systems of French missiles and the position-finding equipment of French nuclear submarines will probably be less accurate than comparable US equipment. The force, however, has been described by the French as consisting of "anti-city" weapons which do not require the accuracy necessary to hit an enemy's strategic military installations.

Other Possible Delivery Systems

22. We do not believe that the French have definite plans for strategic delivery systems beyond those described. Some evidence suggests that they are considering the development of a land-mobile MRBM/IRBM system some time in the future, but we believe that little beyond feasibility studies has been undertaken to date. In addition, some French air force leaders have expressed the view that more advanced strategic aircraft with long range air-to-surface missiles should be developed in the future. Neither of these delivery systems could probably become operational before the mid-1970s, even if the French should decide in the near future to develop them.

23. French military spokesmen have also indicated interest in eventually acquiring surface-to-surface missiles of less than IRBM range, including tactical missile systems. The missile will have a payload of about 1,900 pounds, and will be capable of carrying either a nuclear warhead or a high-explosive warhead. Series production was to have begun in late 1965, but this now appears unlikely until well into 1966.

II. THE ECONOMIC IMPACT OF THE PROGRAM

24. We estimate the costs of the French advanced weapons program as follows:

ESTIMATED INVESTMENT AND OPERATING COSTS OF FRENCH ADVANCED WEAPONS PROGRAM*

(in millions of dollars calculated from the current rate of 4.9 French francs to the dollar)

Type of Activity	1960–1964 (Five-Year Period)	1965–1970 (Six-Year Period)
Nuclear weapons and development of nuclear propulsion systems for submarines	$2,000–2,200	$5,000–7,000
Mirage IV aircraft system	250–300	500–600
Land-based missile systems	250–400	1,250–1,750
Submarines and submarine-missile system		2,000–3,000
TOTALS (Rounded)	$2,500–3,000	$9,000–12,000

* See Appendix I for additional details on the costs of the French program.

25. The French are presently spending about five and one-half percent of their gross national product (in market prices) for military purposes. Somewhat more than one percent is devoted to nuclear weapons and delivery systems. Under present plans this will probably increase to about two percent of GNP in the late 1960s, assuming that the economy expands at about present annual rates. Numerous French officials have stated during the past year that total defense spending is to remain at the present proportion of GNP. If it does, this would severely limit conventional military expenditures. The French have already curtailed programs to modernize their conventional forces, and they will be forced into further cutbacks if they carry out their presently planned advanced weapons program without increasing the overall military burden on the economy.

26. The French economy is capable of supporting the planned scale of military expenditures, and indeed would be able to increase them, but such an increase would require difficult and, perhaps, risky political decisions. There are strong social and political pressures on the government to modernize the antiquated and acutely inadequate school and hospital systems, the housing situation, and the road net. We believe that so long as de Gaulle is in power, the government will do what is economically and politically necessary to keep its nuclear weapons program close to schedule. Another government might be more sensitive than de Gaulle to domestic pressures to limit military expenditures, and might therefore slow down or stretch out the program. We do not believe, however, that such pressures would cause any likely successor government to abandon or cut it back drastically.

III. ASSISTANCE FROM OTHER COUNTRIES

27. The French nuclear weapons program has been and continues to be almost entirely self-sufficient.

French delivery systems programs could move forward on French resources and capabilities alone, but to the extent that foreign technology and equipment were denied, costs would increase and there would be delay.

28. Other European nations are unlikely to provide direct assistance to the French nuclear weapons program. For several years there have been rumors and reports that the French have approached the West Germans for assistance in the French program. Our evidence is still not sufficient to corroborate either these reports or French and German denials of the reports. We believe, however, that if such overtures have been made, the Germans have rejected them. There have also been occasional hints from Gaullist sources that France would like some day to have all the Common Market countries associated with the French nuclear force. However, we believe that these countries are and will remain unwilling to participate in joint nuclear weapons programs with the French which are independent of NATO and not arranged in close consultation with the US, unless there are fundamental changes in the present Western security system.

29. The situation is different in the case of the French missile program. Participation in the European Space Research Organization (ESRO) and the European Launcher Development Organization (ELDO) has given the French access to foreign technology. In addition, as already mentioned, the French have undertaken joint projects with the West Germans and the British to develop short-range air-to-surface missiles. We believe that the French, if they desire, will be able to organize other joint missile projects in the future. Such projects, while oriented toward the development of conventional weapons or toward space research goals, would also add to French experience and capabilities for developing nuclear delivery systems.

APPENDIX I

COSTS OF THE FRENCH ADVANCED WEAPONS PROGRAM

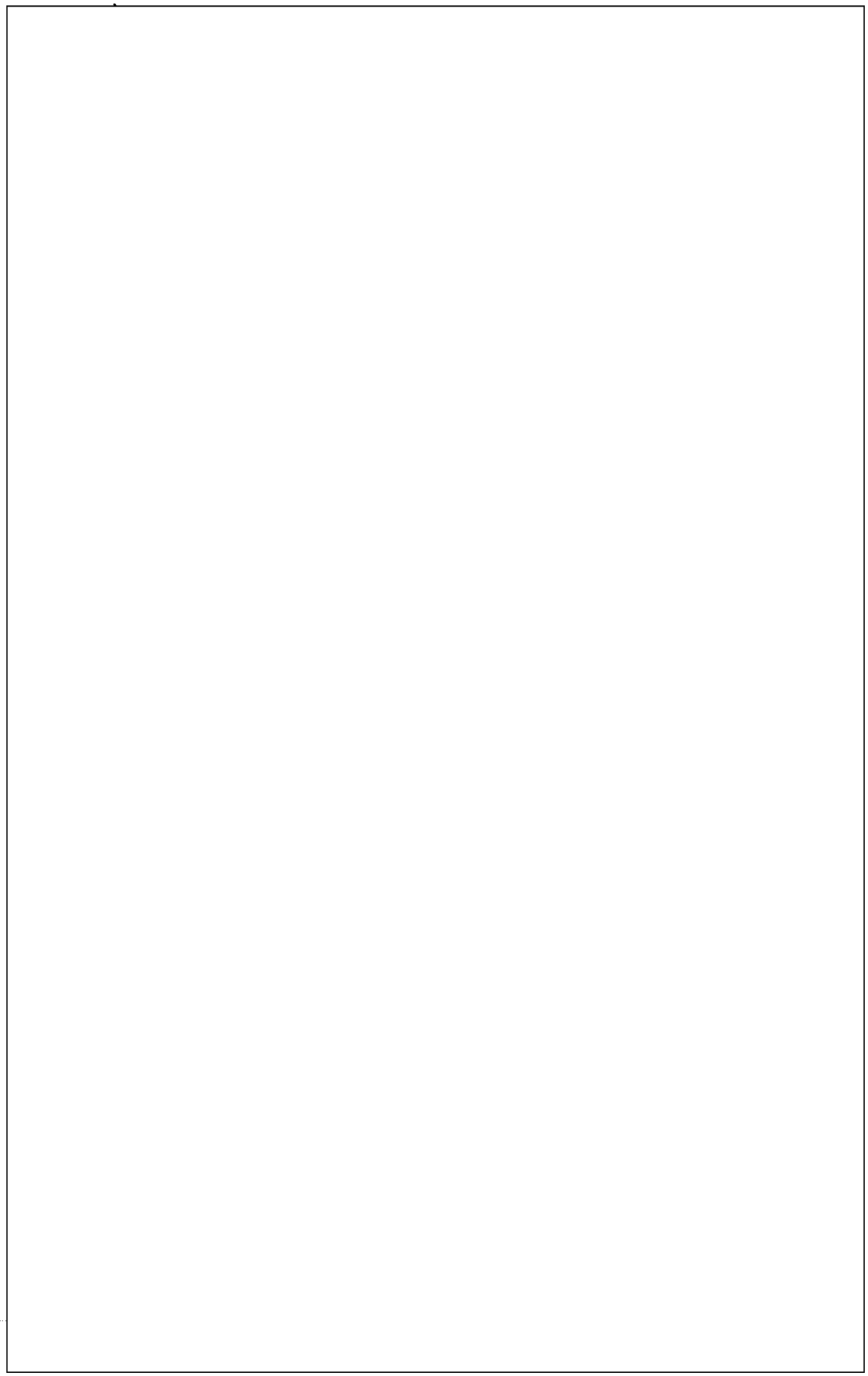
1. Figures published by the French Government on the costs of its advanced weapons program are considerably smaller than the figures which appear in the table in paragraph 24 of this estimate. The French figures cover only those expenditures labelled in the French budget as being for production and research for the nuclear forces. They do not include substantial expenditures on facilities used jointly for military and for peaceful purposes, which are allocated to France's peaceful nuclear program. We have included a portion of these costs in our table. We have also included some administrative and operating costs of the French advanced weapons program which the French have not so identified. In addition, the French have sometimes deliberately understated the future costs of specific advanced weapons programs, in order to blunt domestic criticism of the high cost of the nuclear force. We expect similar understatements to occur in the future. Furthermore, the underestimation of costs has been characteristic of advanced weapons systems throughout the world. It is to a degree not deliberate but a product of the uncertainties of developing such systems.

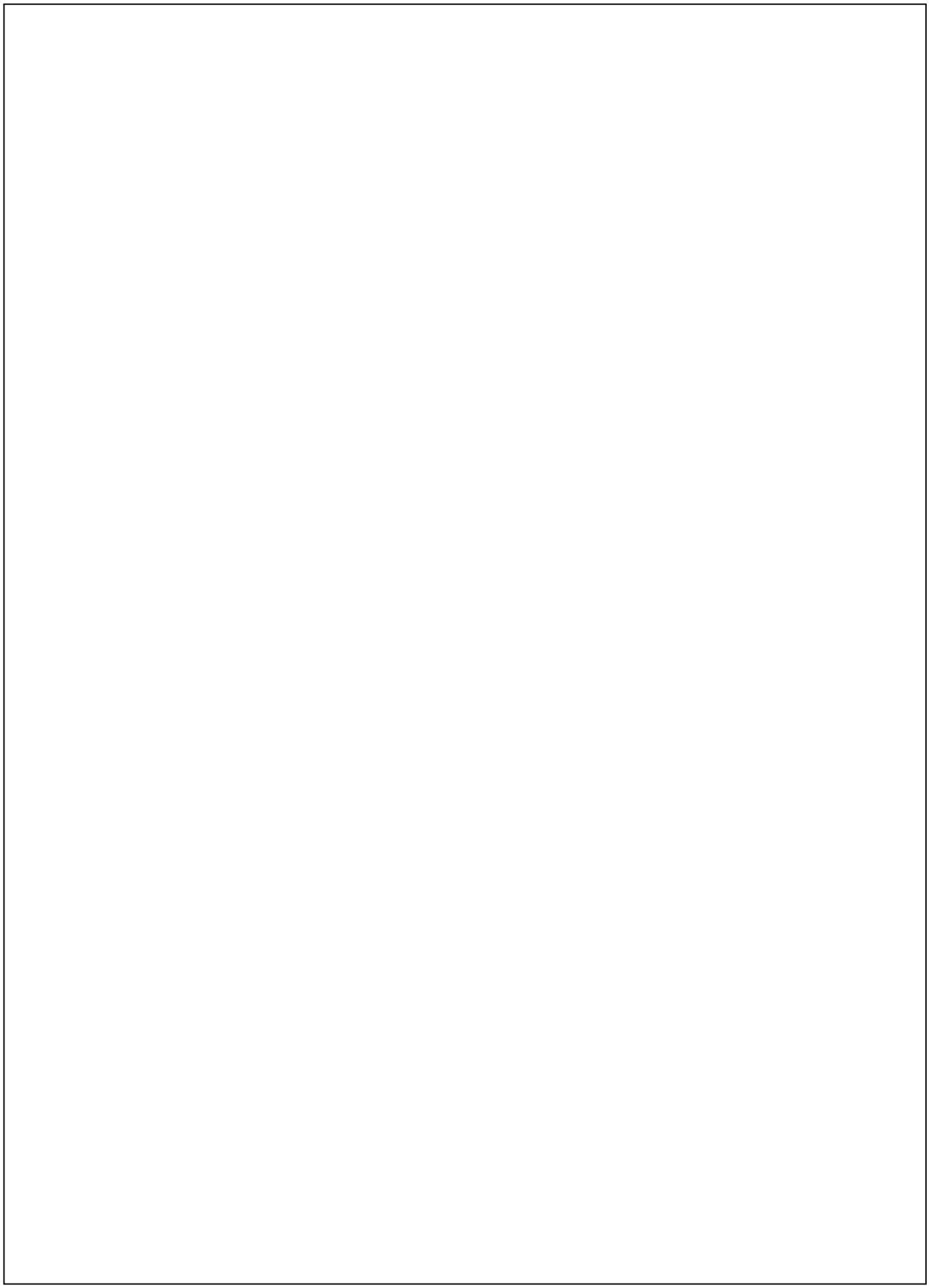
2. We believe that expenses directly related to nuclear weapons and propulsion have accounted for $2,000 million to $2,200 million, or at least two-thirds of the total costs of France's advanced weapons program, in the five-year period 1960 through 1964. During this period, announced payments from the nuclear account of the defense budget, for purposes of a direct military character, amounted to about $1,200 million. The military share in the joint costs of other parts of the French nuclear program is estimated to be about $800 million. Additional expenditures from the regular operating budgets of the French armed services associated with the development of nuclear weapons but not so identified may have amounted to another hundred million dollars or more.

3. For the future, we estimate that the nuclear aspects of the French advanced weapons program will cost about $5,000 million to $7,000 million for the six-year period 1965-1970. Such costs will probably be about $800 million in 1965, and rise to roughly $1,000 million annually by 1967. The years 1965 through 1967 will be a period of very heavy expenditure, since they will include more than $500 million for the completion, testing, and start-up of the Pierrelatte gaseous diffusion plant, and some $400 million for completion of the nuclear test site in the Pacific. After completion of these major projects, annual expenditures on the nuclear aspects of the advanced weapons program may decline, but we believe they are more likely to remain at a level of about $1,000 million per year through 1970. The cost of operating the new facilities; development,

production and testing of a variety of high and low yield nuclear weapons; and further development of nuclear propulsion systems will necessitate a continued high level of spending.

4. Our estimates of costs for the Mirage IV aircraft, land-based missile, and submarine-missile delivery systems are based principally on French budgetary information and other statements of French sources concerning the future costs of these systems. As in the case of our estimates on nuclear weapons, we have included additional expenditures from the operating budgets of the armed services which are associated with the development and operation of delivery systems but are not so identified by the French. In contrast to the projected costs of the French nuclear weapons program, we expect expenditures on delivery systems to rise continually from now through 1970. Most of the Mirage IV type bombers are still to be produced and paid for, and the bulk of expenditures on the land-based missile systems and the submarine-missile system is still to be made.





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